

# The Role of Mindfulness-Based Stress Reduction on Perceived Stress: Preliminary Evidence for the Moderating Role of Attachment Style

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The current research investigated whether adult attachment style moderated the effect of mindfulness-based stress reduction (MBSR) participation on levels of perceived stress. Study completing participants (secure group  $n = 65$ ; insecure group  $n = 66$ ) completed pre- and postintervention self-report assessments of perceived stress. The insecure group reported significantly higher stress levels prior to MBSR participation, but both groups showed significant pre-post intervention declines in perceived stress. Compared to the secure group, the insecure group also reported marginally lower perceived stress following MBSR participation. Study findings support the efficacy of MBSR for stress reduction across attachment style. Findings also suggest that MBSR participation may provide slightly greater stress reduction benefits for insecurely attached individuals.

**Keywords:** MBSR; attachment style; perceived stress; mindfulness

Mindfulness is a state of attentiveness to present events and experiences that is unmediated by discursive or discriminating cognition (Brown, Ryan, & Creswell, 2007; Grossman, Niemann, Schmidt, & Walach, 2004). Programs now widely available in Western medical and mental health settings, including mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) and mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002), have been specifically designed to train individuals in mindfulness under the assumption that mindfulness enhancement fosters greater psychological well-being and mental health. A growing body of empirical evidence supports this assumption (see reviews by Baer, 2003; Brown et al., 2007; Grossman et al., 2004).

MBSR has been applied to a wide variety of healthy stressed and clinical populations. This manualized, group-based program teaches mindfulness for use in everyday life to facilitate stress management and a variety of other adaptive goals. The association between mindfulness training and adaptive functioning in stress-relevant contexts has been supported by research showing

mindfulness to be positively associated with adaptive emotion regulatory strategies, including emotional awareness, acceptance, and letting go of negative thoughts (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Brown & Ryan, 2003; Frewen, Evans, Maraj, Dozois, & Partridge, 2008), and negatively correlated with maladaptive forms of emotion regulation, including thought suppression, rumination, impulsivity, and passivity (Baer et al., 2006; Brown & Ryan, 2003; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007; Frewen et al., in press; McKee, Zvolensky, Solomon, Bernstein, & Leen-Feldner, 2007). Participation in MBSR has been associated with reduced stress in both clinical populations (e.g., Carmody, Crawford, & Churchill, 2006; Galantino, Baime, Maguire, Szapary, & Farrar, 2005; Specia, Carlson, Goodey, & Angen, 2000) and healthy stressed populations (e.g., Chang et al., 2004).

In sum, a growing body of research suggests that participation in MBSR programs is associated with stress reduction. However, it is not known whether there are important individual differences that moderate these effects. Knowing what kind of intervention is most appropriate for which clients is a central question for psychotherapy clinicians and researchers (Beutler, 1991; Bühringer, 2006; Dance & Neufeld, 1988; Lakey & Ondersma, 2008). With the growing popularity of mindfulness-based interventions, identifying those individuals most likely to benefit from these programs becomes increasingly important to maximize intervention effectiveness, among other important concerns. In the present research, we focused on the role of interpersonal attachment style as a potential moderator of MBSR effects on stress levels.

### Adult Attachment, Stress Response, and MBSR

Adult attachment styles have their origins in children's formative experiences with primary caregivers. According to attachment theory, children who perceive their primary caregivers as consistently nurturing are likely to develop secure attachment styles, whereas children who experience their caregivers as inconsistent or unavailable may be at risk for insecure attachment (Bowlby, 1973, 1980, 1982). Over time, children's repeated experiences with their attachment figures become internalized into working models, or schemas, of the self, others, and relationships that influence social and emotional processes across the life span (Thompson & Raikes, 2003). In the normative American adult population, secure attachment style is found in approximately 56% to 59% of individuals, according to self-report measures, while 36% to 44% score as insecurely attached (Hazan & Shaver, 1987; Mickelson, Kessler, & Shaver, 1997). Of particular relevance to the present discussion, attachment styles formed in childhood can influence interpersonal functioning and emotional regulation skills that have implications for stress responsiveness in adolescence and adulthood (Cassidy, 2000; Dozier, Stovall, & Albus, 1999). Research has shown that secure attachment has been associated with greater stress resiliency than insecure attachment, which has been positively correlated with increased stress vulnerability (Ditzen et al., 2008; Gallo & Matthews, 2006; Hawkins, Howard, & Oyebo, 2007).

This research indicates that insecurely attached adults, in particular, may benefit from programs such as MBSR that is focused on stress reduction using methods designed to foster awareness of socialization and other learning histories that have consequences for stress responsiveness. Specifically, it could be expected that, compared to securely attached individuals, insecurely attached persons may demonstrate greater reductions in perceived stress following MBSR participation because, as past research indicates, they are likely to enter the intervention with higher stress levels. However, a contrary prediction is also viable. Because MBSR is a group-based intervention that places considerable emphasis on dyadic interaction, group discussion, and social support, insecurely attached individuals may find the program itself to be stressful, resulting in a higher dropout rate and little change in stress levels through program participation relative to those securely attached. The primary purpose of the present research was to test these competing hypotheses. This moderation question is important not only because insecure

attachment style is associated with elevated stress and a variety of other detrimental personal and interpersonal consequences but also because psychotherapeutic treatment of insecurely attached persons presents special challenges (see review by Meyer & Pilkonis, 2001).

Although the moderating role of attachment style on MBSR effects has not been addressed in the MBSR literature, dialectical behavior therapy (DBT) research findings offer indirect support for the possibility that persons with insecure attachment may benefit from mindfulness skills development. DBT is a manualized, multimodal treatment package (Linehan, 1993a, 1993b) originally developed for persons meeting criteria for borderline personality disorder (BPD), a diagnosis that has been associated with insecure attachment style (for a review, see Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004). DBT has been found to be efficacious for the treatment of BPD in seven randomized controlled trials (for a review, see Lynch, Trost, Salsman, & Linehan, 2007). Further, there is growing research support for the role of mindfulness skills in the efficacy of DBT (e.g., Miller, Wyman, Huppert, Glassman, & Rathus, 2000).

However, DBT differs from MBSR in several important ways that may affect treatment success for participants with insecure attachment. One difference is that while mindfulness is the central focus of MBSR, in DBT it is one of several skills that are taught in the skills training portion of the intervention. Another difference is that MBSR is a brief (8–10 weeks) program taught in a group format, whereas DBT is a lengthier intervention (approximately 1 year) that includes individual therapy in addition to group skills training. A final difference is that MBSR was originally conceived as a program taught in a heterogeneous group setting with participants ranging from healthy stressed persons to those with medical and/or psychological conditions, while DBT was developed as a therapy for persons with BPD.

## The Present Research

The primary purpose of the present study was to investigate whether adult attachment style moderates the effect of MBSR participation on levels of perceived stress. Perceived stress was assessed before and after the 8-week MBSR intervention in a large sample of community-dwelling adults differing in attachment style. We first sought to determine whether, as past research has indicated, insecurely attached individuals in the present study reported higher levels of perceived stress before the intervention. Showing that insecure attachment is associated with higher levels of perceived stress would strengthen the basis for investigating whether such elevated stress can be reduced through mindfulness training. We then proceeded to the primary test of this study, namely, whether attachment style moderates the effectiveness of MBSR in reducing stress.

Two conditions necessary to demonstrate moderation of a treatment effect are pertinent to the present study (e.g., Kraemer, Wilson, Fairburn, & Agras, 2002).<sup>1</sup> First, the moderator must be a baseline or prerandomization characteristic that varies in the study population. As discussed already, adult attachment style meets this condition. Second, the effect size of the treatment must be shown to vary as a function of scores or levels of the moderator variable. The test of this condition will be the primary focus of this article. In accord with our larger goal of testing the feasibility of MBSR for insecurely attached individuals, we also examined whether intervention dropout rates differed across the two primary forms of adult attachment style.

## METHOD

### Participants

The intent-to-treat (ITT) sample of participants was comprised of 185 individuals enrolled in 31 MBSR programs in 14 U.S. states. No compensation for study participation was given. Of the 18 MBSR program instructors, teaching experience information was obtainable on 16 of them.

These had an average of 5.72 years of MBSR teaching experience ( $SD = 3.92$ ; range = 1–15 years) and had taught an average of 12.47 8-week MBSR courses ( $SD = 10.18$ ; range = 1–34 courses).

Using the published guidelines associated with the administered attachment scale (see the section “Psychological Measures”), two attachment categories were created: (a) securely attached persons ( $n = 86$ ) and (b) insecurely attached persons ( $n = 99$ ). The demographic composition of each attachment group is shown in Table 1. The secure group had a mean age of 49.57 ( $SD = 12.99$ ; range = 23–79), identified themselves as predominantly female (79%), White/Caucasian (97%), and married or in a committed relationship (93%). The insecure group were, on average, 47.07 years of age ( $SD = 12.24$ ; range = 21–75), were 79% female, and 94% White/Caucasian. This demographic composition was nonsignificantly different from the secure group (all  $ps > .19$ ). However, the insecure group were less likely to be married or in a committed relationship (63%;  $p < .001$ ).

Of the 185 ITT participants, 26 individuals (secure group  $n = 8$ ; insecure group  $n = 18$ ) did not complete the intervention. An additional 28 persons (secure group  $n = 14$ ; insecure group  $n = 14$ ) did not complete postintervention measures. This left a completer sample of  $N = 131$  participants (secure group  $n = 65$ ; insecure group  $n = 66$ ) for analyses of MBSR effects.

## Procedure

After obtaining approval from the Institutional Review Board of James Madison University, participants were recruited through their MBSR instructors, who read a scripted description of

**TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS**

Variable	Attachment Style Group		$P_{diff}$
	Secure $n = 86$	Insecure $n = 99$	
Age, mean $\pm$ $SD$	49.57 $\pm$ 12.99	47.07 $\pm$ 12.24	.19
Gender, $N$ (%)			.95
Female	68 (79%)	78 (79%)	
Male	17 (20%)	20 (20%)	
Undisclosed	1 (1%)	1 (1%)	
Ethnicity, $N$ (%)			.26
African American	—	3 (3%)	
Asian Pacific Islander	1 (1%)	—	
White	83 (97%)	93 (94%)	
Hispanic/Latino	1 (1%)	2 (2%)	
Undisclosed	1 (1%)	1 (1%)	
Relationship status, $N$ (%)			<.001
Married/committed relationship	79 (93%)	61 (62%)	
Single	2 (2%)	14 (14%)	
Divorced/separated	3 (4%)	21 (21%)	
Widowed	1 (1%)	2 (2%)	
Undisclosed	—	1 (1%)	

Note. The  $p_{diff}$  column shows significance levels based on  $t$  and  $\chi^2$  tests of group differences.

the study at the beginning of the first program session and prior to presenting course material. The study description explained that study participation involved completing a short series of questionnaires at two time points and assured students that their participation in the study was fully voluntary and strictly confidential and that they had the option to withdraw from the study at any time. After providing informed consent, participants completed all baseline demographic and psychological measures before receiving any mindfulness instruction. The same psychological measures were completed in the final MBSR session.

**Intervention: MBSR.** The MBSR program has been described in detail elsewhere (Kabat-Zinn, 1982, 1990). Briefly, MBSR is a manualized program teaching mindfulness using a variety of experiential methods. Participants attend eight weekly 2.5-hour classes, plus a daylong retreat that is typically held during the sixth week of the program. In addition to weekly group meetings, students are asked to spend an additional 45 minutes a day, 6 days a week, practicing the methods taught in class as a means to foster the use of mindfulness in daily life.

MBSR sessions provide training in formal mindfulness practices, including body scan, sitting meditation, and hatha yoga. Mindfulness practice is also done through dyadic and group interaction. Body scan involves directing attention sequentially on each major part of the body, focusing attention particularly on the sensations that are present in each part. In the sitting meditation portion, attention is first focused on the breath, then expanded outward to include awareness of internal and external stimuli, including sensations, thoughts, emotions, and sounds. Hatha yoga, which involves moving the body through a series of postures in order to develop greater strength, balance, flexibility, and body awareness, is included in the program as a means of encouraging attentiveness to body sensations and movement. Participants are also encouraged to practice mindfulness informally by bringing attention to emotions, thoughts, and appraisals that occur while engaged in everyday activities, including walking, eating, driving, working, and conversing.

## Psychological Measures

The *Experiences in Close Relationships—Revised Questionnaire* (ECR-R; Fraley, Waller, & Brennan, 2000) is a well-validated, 36-item self-report assessment of adult attachment. The scale is comprised of two 18-item subscales that represent the two latent dimensions hypothesized to underlie the attachment construct: attachment-related anxiety and attachment-related avoidance. Items are rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores reflecting greater endorsement of the construct. Numerous studies have supported the hypothesized two-factor structure of the ECR-R as well as its reliability and its convergent and discriminant validity (e.g., Fairchild & Finney, 2006; Sibley, Fischer, & Liu, 2006). In the current study, internal consistency for both subscales in both groups was adequate (secure group Cronbach's  $\alpha = .70$  for the anxiety subscale and  $\alpha = .80$  for the avoidance subscale; insecure group  $\alpha = .86$  for the anxiety subscale and  $\alpha = .87$  for the avoidance subscale). Participants completed this measure at baseline.

Although the ECR-R is a dimensional measure, Fraley et al. (2000) provided an algorithm that transforms ECR-R scores into one of four attachment style categories (Brennan, Clark, & Shaver, 1998). This transformation was applied in the current study to categorize participants as either secure (low anxiety/low avoidance), preoccupied (low avoidance/high anxiety), fearful-avoidant (high anxiety/high avoidance), or dismissing-avoidant (low anxiety/high avoidance). The last three categories were then combined to form an overall insecure attachment category. The decision to combine the three insecure categories was based on Bowlby's (1973, 1982) conceptualization of secure versus insecure attachment styles. The general insecure attachment category is a common convention in the attachment literature (e.g., Armitage & Harris, 2006; Dieperink, Leskela, Thuras, & Engdahl, 2001; Lawson, Barnes, Madkins, & Francois-Lamonte,

2006). Practically, collapsing across insecure categories increased the size of the insecure group and produced similar sample sizes for the secure and insecure groups, which together increased the power of the statistical tests.

The *Perceptions of Stress Scale* (PSS-10; Cohen, Karmarck, & Mermelstein, 1983) is a well-validated, 10-item, one-factor inventory that is frequently used in MBSR and other clinical intervention studies (e.g., Carmody et al., 2006; Chang et al., 2004). The scale measures the extent to which participants perceive their life circumstances over the past month as stressful (i.e., unpredictable, uncontrollable, and overloading). Items are rated on a 4-point scale ranging from 0 (never) to 4 (very often), with higher scores reflecting greater perceived stress. The PSS-10 has demonstrated adequate internal consistency ( $\alpha = .75$ ), test-retest reliability, and construct validity (Cohen et al., 1983; Cole, 1999) and is modestly correlated with other measures of appraised stress (Cohen & Wills, 1998). In the current study, internal reliability in the secure group was  $\alpha = .88$  at baseline and  $\alpha = .90$  postintervention; in the insecure group,  $\alpha$ s were .91 at baseline and .88 at postintervention.

### Statistical Analyses

Baseline (pretreatment) attachment group differences in PSS stress were assessed via univariate analysis of variance (ANOVA) using the full ITT sample ( $N = 185$ ). To assess the moderating effect of baseline mindfulness on the effect of MBSR on the perceived stress outcome, a 2 (Attachment Group)  $\times$  2 (Time) mixed-model ANOVA was conducted using data from the study completer sample ( $N = 131$ ). In this analysis, primary interest was in all three model effects: The attachment group and time main effects and the Attachment Group  $\times$  Time interaction. A significant time main effect would indicate that insecurely attached as well as securely attached participants reported changes in stress over the course of MBSR, while a significant group effect would indicate persistent differences in stress from pre- to postintervention. A significant Group  $\times$  Time interaction would indicate differential changes in stress to one attachment group over the other. For all primary analyses, effect size estimates based on eta squared ( $\eta^2$ ) were calculated to examine the clinical significance of the observed effects. Before beginning analyses, all continuous variables at each time point were checked for skewness and kurtosis; all continuous variables were normally distributed. Because one or both of the attachment groups were quite demographically homogeneous, the sex, race/ethnicity, and marital status variables were not further considered.

## RESULTS

Preliminary analysis showed that age was not a significant predictor of the stress outcome, either a main or an interactive effect ( $ps > .05$ ), so it will not be further considered.

### Baseline Attachment Style Difference in Perceived Stress

A univariate ANOVA revealed a significant difference between attachment groups in pretreatment perceived stress. The secure group ( $M = 18.08$ ,  $SD = 6.72$ ) had a lower reported mean stress score than the insecure group ( $M = 22.67$ ,  $SD = 7.05$ ),  $F(1, 183) = 20.33$ ,  $p < .001$ ,  $\eta^2 = .10$ .

### Relation of Attachment Style and Time to Treatment-Related Stress Reduction

A mixed-model ANOVA (Group [secure, insecure]  $\times$  Time [pre- to posttreatment]) revealed a main effect for time,  $F(1, 129) = 88.77$ ,  $p < .001$ ,  $\eta^2 = .41$ , on perceived stress such that, compared to baseline ( $M = 19.94$ ,  $SD = 7.15$ ), participants reported significantly less perceived stress at the end of the MBSR program ( $M = 14.63$ ,  $SD = 5.76$ ). The main effect for attachment group was

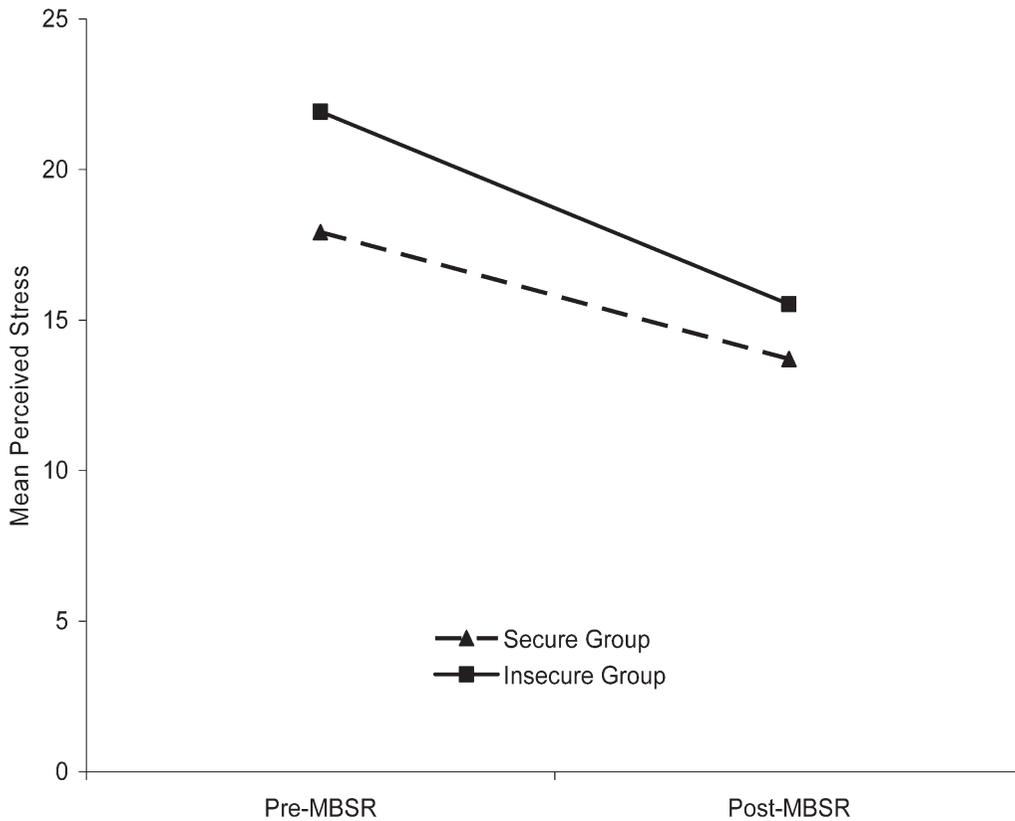


FIGURE 1. Baseline and post-MBSR mean perceived stress scores (PSS-10) by attachment style group.

also significant,  $F(1, 129) = 9.36, p < .01, \eta^2 = .07$ ; inspection of mean stress scores showed that the secure group reported significantly less stress than the insecure group at both pretreatment (as reported already) and at posttreatment (secure group  $M$  at postintervention = 13.71,  $SD = 5.85$ ; insecure group  $M$  at postintervention = 15.53,  $SD = 5.57$ ). Finally, there was a marginally significant Group  $\times$  Time interaction effect on PSS-10 scores such that, compared to the secure group, the insecure group reported a marginally greater reduction in perceived stress following MBSR participation,  $F(1, 129) = 3.74, p = .06, \eta^2 = .03$ . This interaction trend is displayed in Figure 1.

### Relation of Attachment Style to Treatment Adherence

Completion of the MBSR program was generally high across attachment groups; however, insecurely attached participants were twice as likely to drop out of the program before completion as were securely attached participants (18% vs. 9%). This difference in dropout rate was significant,  $\chi^2(1) = 65.30, p < .001$ . This suggests that insecurely attached persons may have had more difficulty tolerating one or more elements of the program.

## DISCUSSION

The primary goal of this study was to investigate whether the effects of MBSR on perceived stress differed among adults differing in interpersonal attachment style. We tested two opposing

hypotheses. First, we anticipated that those insecurely attached may report greater reductions in perceived stress following MBSR because they have generally higher stress levels (e.g., Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006; Mikulincer & Florian, 1998; Mikulincer, Florian, & Weller, 1993). We also anticipated that the group-based, social nature of the intervention may itself present stresses to those insecurely attached, with the consequence that such individuals may show a higher program dropout rate and less change in stress levels from pre- to postintervention compared to securely attached individuals.

Study findings revealed that insecurely attached persons did in fact report higher levels of perceived stress at baseline than those securely attached. This supports previous findings regarding the relationship between attachment security and stress (e.g., Fraley, Fazzari, Bonanno, & Dekel, 2006; Krenke-Seiffge, 2006; Mikulincer & Florian, 1998). In addition, this finding highlights the importance of stress reduction interventions for insecurely attached persons who are at greater risk for stress-related problems, including poor sleep quality (Hall et al., 2000), substance abuse and relapse (Brady & Sonne, 1999; Sinha, 2001), and reduced immune functioning (Segerstrom & Miller, 2004).

Regarding the relation of attachment style to MBSR stress reduction, the present study showed that both securely and insecurely attached MBSR participants reported significant pre- to postintervention declines in perceived stress, even though the insecurely attached individuals started the program at a higher stress level. However, this finding was qualified by a marginally significant interaction between attachment style and time such that insecurely attached participants reported marginally greater reductions in perceived stress following MBSR participation than those securely attached. These findings are notable in light of research demonstrating that attachment insecurity presents psychotherapeutic challenges (e.g., Dozier, 1990; Korfmacher, Adam, Ogawa, & Egeland, 1997; McBride, Bagby, & Atkinson, 2006; Ravitz, Maunder, & McBride, 2008).

To some degree, these findings regarding the stress reduction benefit of MBSR for those insecurely attached must be interpreted in light of the fact that 18% of these individuals did not complete the MBSR program (compared to half that percentage for those securely attached). While attrition rates for both groups fell within the ranges typically reported for MBSR interventions (<20%; e.g., Kabat-Zinn, Lipworth, & Burney, 1985; Shapiro, Schwartz, & Bonner, 1998), the significant difference in completion rates suggests that the MBSR benefit for insecurely attached persons may be restricted to a self-selected portion of that population. Interpreted differently, however, the results may suggest that for insecurely attached individuals willing to “stick it out,” MBSR offers stress reduction benefit, perhaps even more so than for securely attached persons. Only further research will reveal the validity of that claim; evidence on reasons for program dropout is needed to determine, for example, whether insecurely attached individuals do indeed find aspects of the program more challenging than securely attached persons.

## Limitations and Future Research

The current study was limited in several ways. First, while the sample was reasonably large, the lack of a control group limited the ability to test the effect of MBSR on stress reduction and, more important for the present purposes, to test whether attachment style was a main effect on stress change over time or was a treatment-specific moderator of stress change. Specifically, lack of randomization precludes the ability to unambiguously identify attachment style as a moderator of stress effects because alternative explanations for study findings, including statistical regression to the mean, could not be ruled out. As such, it may be said that the study findings are consistent with the possibility that insecure attachment may have functioned as a moderating variable in this sample.

Second, the sample was quite demographically homogeneous, limited largely to White women, and the role of gender and race/ethnicity on treatment and moderator effects should

be investigated in future research. Third, the study relied on subjective measures of attachment style and stress, and no follow-up data were available to test the durability of the stress reduction changes over time. In addition to addressing these limitations, future research should also include assessments to identify which aspects of MBSR (e.g., class attendance, specific mindfulness practices, didactic instruction, and social support) contribute to well-being outcomes to determine which aspects of the program may be most helpful and detrimental to insecurely attached individuals. For example, previous research indicates that social support and provision of an environment conducive to self-disclosure promotes psychological well-being (Chang et al., 2004). However, in light of evidence that, compared to securely attached persons, individuals with insecure attachment styles tend to perceive social support more negatively (e.g., Collins & Feeney, 2004), the group setting of MBSR may present a stressor for persons with this attachment style. Future research would also benefit from investigating whether the three insecure attachment subgroups (i.e., preoccupied, fearful-avoidant, and dismissing-avoidant) differ in treatment effects and responsiveness to MBSR program components.

In summary, the study findings support the efficacy of mindfulness training for stress reduction across the two major classes of attachment style, with some suggestion that those who are insecurely attached may benefit from MBSR participation to a greater degree than their securely attached counterparts. These conclusions must be deemed tentative in light of the methodological limitations discussed here, but they offer initial evidence that attachment style may be an important individual difference characteristic to be considered in assessing the person-specific efficacy of mindfulness training programs such as MBSR.

## NOTE

1. Another condition to demonstrate treatment moderation is that levels of the moderator must not differ across treatment condition; this condition is usually met through random assignment to conditions, but since the present study did not include a control group, this condition is not tested here.

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